

GPS-based monitoring of land subsidence in the Po Plain (Northern Italy).

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ABSTRACT

We use regional and local networks of continuously-operating GPS stations (CGPS) distributed in the northern–central part of the Italian peninsula to investigate the subsidence phenomenon of the Po plain sedimentary basin and vertical movements of the surrounding areas. The observations of 146 scientific and commercial stations are analyzed and compared, adopting analytical techniques widely used to study GPS coordinate time series. The use of simple antenna supports in commercial installations, instead of a more rigorous geodetic monument, does not seem to induce significant differences in the noise characteristics and in the amplitudes of annual and semi-annual periodic signals.

The vertical velocity field deduced from 129 sites with observation time spans greater than one year, located in the Central–Northern Italian Peninsula, indicates the presence of two mainly subsidence areas: the Po Plain and the Arno Plain, while the sites located in the Alps and Apennine domains show relatively low uplift.

The areas of the Po Plain monitored by GPS seem to indicate that the subsidence rate is constant or, in some cases, decreasing with respect to the values obtained from the last measurements, performed up to 2006 by means of both SAR and levelling techniques. Only the central part of the eastern Po Plain close to the Apennine border (Modena city area) is characterized by a peak in subsidence consisting in a velocity of about 15 mm/yr.

Keywords: subsidence; Po Plain; GPS; noise model